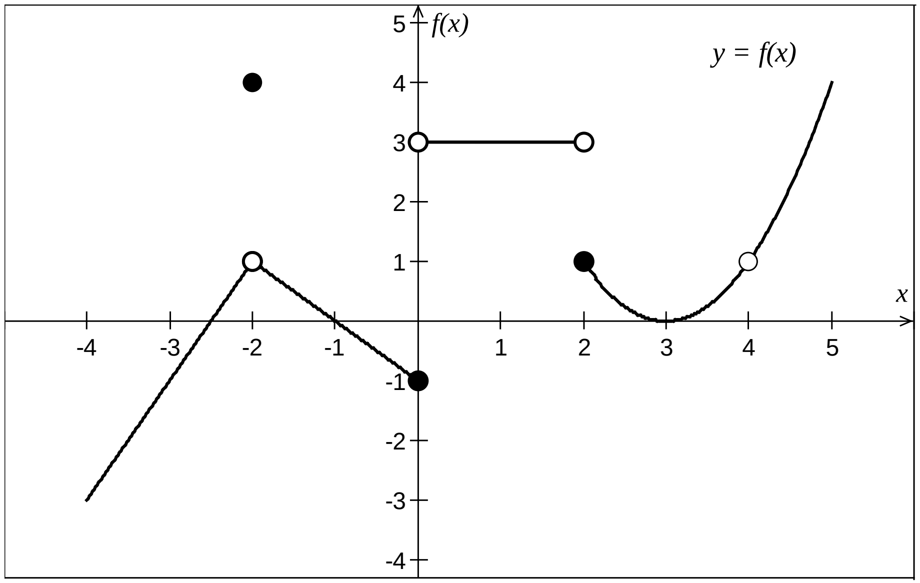
Limits and Continuity Homework   Name ____________________

Problems 1–10, use the graph of the function $y = f(x)$ to estimate the limits.



1. A) $\lim_{x \to -1^-} f(x) =$ B) $\lim_{x \to -1^+} f(x) =$ C) $\lim_{x \to -1} f(x) =$

2. A) $\lim_{x \to 0^-} f(x) =$ B) $\lim_{x \to 0^+} f(x) =$ C) $\lim_{x \to 0} f(x) =$

3. A) $\lim_{x \to 2^-} f(x) =$ B) $\lim_{x \to 2^+} f(x) =$ C) $\lim_{x \to 2} f(x) =$

4. A) $\lim_{x \to -2^-} f(x) =$ B) $\lim_{x \to -2^+} f(x) =$ C) $\lim_{x \to -2} f(x) =$

5. A) $\lim_{x \to 4^-} f(x) =$ B) $\lim_{x \to 4^+} f(x) =$ C) $\lim_{x \to 4} f(x) =$

6. A) $\lim_{x \to -1} f(x) =$ B) $f(-1) =$ C) Is f continuous at $x = -1$? Why?

7. A) $\lim_{x \to -2} f(x) =$ B) $f(-2) =$ C) Is f continuous at $x = -2$? Why?

8. A) $\lim_{x \to 0} f(x) =$ B) $f(0) =$ C) Is f continuous at $x = 0$? Why?

9. A) $\lim_{x \to 2} f(x) =$ B) $f(2) =$ C) Is f continuous at $x = 2$? Why?

10. A) $\lim_{x \to 4} f(x) =$ B) $f(4) =$ C) Is f continuous at $x = 4$? Why?

Problems 11 – 14, classify the discontinuities of each function below as removable, jump, or infinite.

11. $f(x) = \begin{cases} x^2 - 1 & x \geq 1 \\ 4 - x & x < 1 \end{cases}$	12. $h(x) = \begin{cases} \lvert x - 3 \rvert & x \neq 2 \\ -4 & x = 2 \end{cases}$
13. $g(x) = \begin{cases} 3 - x & x \geq 1 \\ x^3 & x < 1 \end{cases}$	14. $f(x) = \begin{cases} x + 1 & x < 2 \\ -1 & x = 2 \\ x^2 + 1 & x > 2 \end{cases}$

Problems 15 – 16, use the three part definition of continuity to determine if the given functions are continuous at the indicated values of *x*.

15. $f(x) = \begin{cases} e^x \cos x\ , & x \geq \pi \\ e^x \tan\left(\frac{3x}{4}\right), & x < \pi \end{cases}$ at $x = \pi$	16. $g(x) = \begin{cases} \frac{x^2-9}{x+3} & x \neq -3 \\ 5 & x = -3 \end{cases}$ at $x = -3$

17. Consider the function $f(x)$ to answer the questions. $f(x) = \begin{cases} -3 & x \leq -1 \\ mx + k & -1 < x < 4 \\ 3 & x \geq 4 \end{cases}$

A. What two limits must be equal in order for the function to be continuous at $x = -1$?

B. What two limits must be equal in order for the function to be continuous at $x = 4$?

C. Find the values of m and k so that the function is continuous everywhere.

Problems 18 – 21, find all value(s) of *a, b, c* or *k* that make the function continuous everywhere.

18. $f(x) = \begin{cases} kx^2 & x \leq 3 \\ 4x - 11 & x > 3 \end{cases}$	19. $g(x) = \begin{cases} cx^2 & x < 1 \\ 4 & x = 1 \\ -x^3 + kx & x > 1 \end{cases}$

20. $h(x) = \begin{cases} \pi & x < 0 \\ x^2 + ax + b & 0 \le x \le 1 \\ 6x + 5 & x > 1 \end{cases}$

21. $f(x) = \begin{cases} x^2 & x < 1 \\ \sin(bx) & x \ge 1 \end{cases}$

22. Write the piecewise function, $g(x)$, that defines the graph shown at right. Then, use the three part definition of continuity to analytically justify why $g(x)$ is discontinuous at $x = 2$ and $x = 5$.